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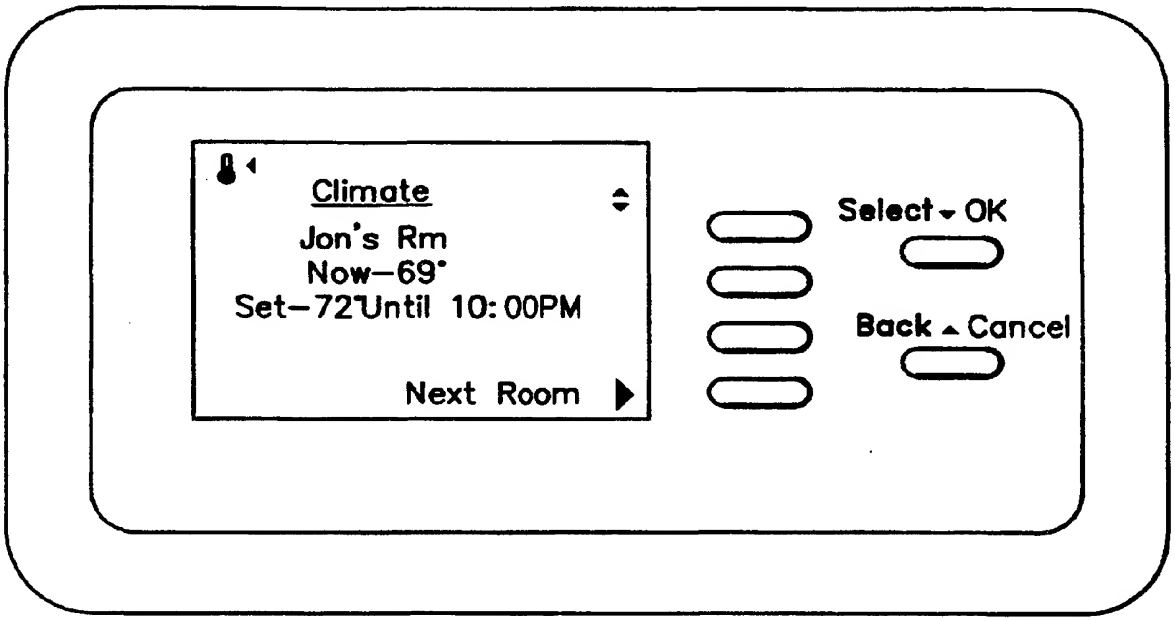

(57) Abstract

A method and apparatus for displaying information associated with a system. Softkeys are used to quickly reach screens associated with a desired system. The system may then be quickly modified using the softkeys.

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MULTIPURPOSE USER INTERFACE

BACKGROUND OF THE INVENTION

This invention is directed toward the field of data display devices, and more specifically to user interfaces for control systems.

There are many control systems installed in or associated with a particular building. For example, temperature controls, lighting controls, security alarms, entertainment controls and outdoor sprinkler systems are all well known systems are which may have electronic controls and they are associated with the building. At one point, such systems each have their own control unit which require a building owner to possibly learn how to control five or six different systems through the different operators.

Eventually, integrated user interfaces became known whereby a number of different control systems could be controlled through one user interface thus allowing a building owner to learn to use only one unit user interface to control a number of systems.

One example of such a user interface is known as Honeywell Graphic Central™ operator interface. The graphic central operator interface is a personal computer with special software which receives signals from a number of different systems and displays information related to the system on the personal computer's display. Generally, a standard screen on such an operator interface would display one or more buildings which could be selected or an information about some area or system in the building as desired. From there, a particular system associated with the building could be selected such as the lighting, HVAC, security, fire or entertainment systems, for display of information. Once a particular system is selected, then a particular site within the building may be selected to determine the status of the system at that point. For example, as shown in Figure 1, first building 5 and second building 10 may be displayed on display 2 of a personal

computer (not shown) which connects the building control systems of building 5 and building 10 together in one operator interface. By moving cursor 11 to building 5, either through use of a mouse (not shown) or the cursor control keys (not shown) of a keyboard, an operator could select a building for more display of information. After selecting building 5, a display such as that shown in Figure 2 would appear so that the operator could decide which particular system associated with the building would be presented for display on screen 2. As examples, icons represented of the particular system such as icon 201 representative of the HVAC system, icon 202 representative of the lighting system, icon 203 representative of an access control system, icon 204 representative of an intrusion alarm system and icon 205 representative of a fire alarm system would be displayed. The operator would then move to cursor 11 to a particular icon which represented the desired system, and press some key associated with selection of the icon to present further information on the temperature control system.

After picking a particular icon, a drawing such as the one shown in Figure 3 would appear on display 2. The drawing would be representative of the floors in building 5. The operator then could move cursor 11 to a particular floor of interest, third floor 303 for selection and select as appropriate for the cursor control means being used.

After a floor has been selected, it is displayed as shown in Figure 4. In Figure 4, floor 303 is shown to have elevator 401, lap 402, hallway 504 and rooms 403, and 406 to 422. Finally, to select temperature information about room 420, cursor 11 is placed over the image of room 420 and selection occurs as normal for the particular cursor control means used.

Selection of room 420 results in a display such as the one shown on Figure 5. Finally, the system will display temperature information related to room 420 such as the current temperature set point, the current time, the next time period for a possible temperature control change and a

possible next set point. If the user desires to change any of the associated information, it is at this point that the user has the ability to do so. One method for changing the information may be by placing the cursor over the information which is desirable to be changed, entering the selection into the computer, and then modifying the selected parameter. All of the previously described movements through the display are well known in the art.

However, a system such as this requires an expensive and powerful microprocessor and display and a large amount of memory in order to store the graphics associated with the system and all of the data associated with the system. Such systems are more complex and accessibly expensive for use in smaller buildings. Further, a large amount of operator training is required for efficient use of the operator interface and the systems associated therewith.

Lastly, many control actions are required by the prior art operator interfaces prior to display of any information associated with a particular system.

SUMMARY OF THE INVENTION

The present invention is a low cost easy to use multipurpose operator interface. The operator interface displays at a top level a display screen which provides summary information on one or more of the systems connected thereto. Through us of a simplified keyboard and software reconfigurable keys, the operator may quickly move through and receive summary information on all systems associated with the user interface.

The user interface includes microprocessor, memory, display means, data entry means and a communication interface, all of which are connected.

The display means is controlled by the microprocessor 2 at a first level display summary screens of each application which is connected to the multipurpose user interface. The display also includes a display command associated with an entry means which is portion of the data entry means. By activating the entry means, the display

will cycle through summary screens for all applications connected to the multipurpose interface. Another entry means not associated with any portion of the display means allows selection of a particular application being displayed for presentation of more detailed information.

If more detailed information about a particular application is selected, specific information about a particular subsystem of the application is displayed along with a command which is associated with an entry means. By actuation of the entry means, specific information about other subsystems of the selected application is displayed. If is desired to change specific information about the subsystem being displayed, an entry means not associated with a portion of the display means may be actuated to reach yet another level of display.

At the third level of display, plural areas on the display means are associated with entry means for modification of the information being displayed for the subsystem that has been selected. One portion of the display may be associated with the data entry means to allow the operator to modify the system parameters being displayed.

BRIEF DESCRIPTION OF THE DRAWINGS

Figures 1-5 show displays from a prior art operator interface.

Figure 6 is a block diagram of the user interface of the present invention.

Figure 7A is a diagram of the hierarchical organization of the user interface. Figure 7B is a flow chart of the method used in operation of the inventive operator interface. Figures 7C and D show representations of the menu hierarchy of one preferred embodiment.

Figure 8 shows the interconnection of the operator interface with other applications connected to the operator interface.

Figure 9 shows a building in which the operator interface and a temperature control system with zone control resides.

Figures 10A through 10N show representative display screens of the inventive user interface.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to Figure 1, thereshown is a block diagram of the inventive user interface 600. Standard configurations of information displays are well known in the art.

Here, the user interface 600 includes data entry means 605, display 610, microprocessor 615, memory 620, communications interface 625 and communications bus 630. Note that there are many possible configurations for communications connection of the parts: communications bus 630 is merely one possibility. Other arrangements of the parts within the scope of the invention, are contemplated.

The display 610, which may be such as a liquid crystal display (LCD) or a cathode ray tube (CRT) is used to display information related to the user interface 600 or to systems connected to the user interface, such as those discussed in connection with Figure 8. The information to be displayed is controlled by the microprocessor 615 which in turn operates on instructions and data from memory 620. Memory 620 may include both random access memory and read only memory. Sample displays are shown in Figures 10A through 10L.

Microprocessor 615 has general supervisor control over communications and actions within the user interface. Microprocessor 615 receives instructions and data from memory 620, user input from data entry means 605 and system data via communications interface 625 and controls what appears on display 610.

Communications interface 625 receives signals transmitted on bus 635, and translates those signals into signals which can be understood by the parts connected to bus 630. In addition, the communication interface 625

translates signals coming in from bus 630 to signals which can be used by systems connected to bus 635 (see Figure 8).

Data entry means 605 may include one or more entry means such as a plural key keyboard. The individual entry means are used by the user to select desired actions for, or to input information into, the user interface. In a preferred embodiment, at least one key is physically positioned in close proximity to the display and can be used as a software reconfigurable key (hereinafter "softkey") and another key has a predetermined, perpetual function. The uses of the softkey and other entry means will be further described in connection with Figures 10A through 10L.

Turning now to Figure 8, thereshown is a block diagram of a system which might incorporate the user interface 600. The user interface 600 is connected to light system 801, security system 802, entertainment system 803, underground sprinkler system 804, and temperature control system 805 via bus 635. Each of these systems may have a controller for control of individual subsystems of the overall system such as for control of individual lights, or zone temperature controls as shown in Figure 9. The user interface is used to display information from, and to input desired control actions into, the one or more of the systems connected to the user interface. Communications among the systems and operator interface connected to bus 635 may be structured using the communications protocol disclosed in United States Patent Application serial number 07/811,772 by David J. Myers and assigned to the assignee of the present application. The foregoing application is incorporated by reference herein.

Referring now to Figure 7A, thereshown is a diagram of the hierarchical organization for the inventive user interface. At Level-1, by actuation of a softkey will move the user interface from one Level-1 display to another while the actuation of the fixed key will cause the user interface to move from Level-1 to Level-2. Thus, the operator may move from one application to another by

actuation of a softkey while actuation of the fixed key will provide more in depth information about the application then being displayed.

Once the user interface is at Level-2, the operator is then again presented with two choices. Actuation of the softkey will move the display within Level-2 while depression of the fixed key will move the user interface to Level-3. Here, actuation of the softkey allows for movement within zones of the application being viewed while actuation of the fixed key will move the user interface on to a data entry level of the user interface.

At Level-3, the operator is presented with plural softkey options and the usual fixed key options. Selection of a softkey will all the display and modification of specific information associated with the display at Level-3. A more detailed description of this operation will be described in the example provided by Figure 10C.

Referring now to Figure 7B is a flow chart of the inventive method. After starting at block 701, the first step is to display a first softkey display on the display means at block 705. The next step requires determining whether a softkey or a fixed key has been actuated at block 710. If a softkey has been actuated, the next step is to modify the display to show the next system/room /data point and update the soft key(s). The method then returns to block 705.

If a fixed key is actuated at block 710, the next step at block 720 requires a determination of which fixed key has been actuated. Here, for example, there are two fixed keys, labeled "Back/Cancel" or "Select/O.K." If the Select/O.K. fixed key has been actuated, the method moves to block 725 at which point the method determines whether the Operator Interface is displaying a Data Entry Screen or a Data Summary Screen. If the Operator Interface is displaying a Data Entry Screen, the method moves to block 740 where the method confirms data changes and updates the softkeys and then returns to block 710. If the Operator

Interface is displaying a Data Summary Screen, the method moves on to block 730.

At block 730 the method determines whether the deepest level of the hierarchy is being displayed. If yes, the method does nothing and returns to block 705. If not, the method provides more in-depth information about the system displayed. The method then returns to block 705.

If the Back/Cancel key has been actuated at block 720, the method next determines whether the Operator Interface is displaying a Data Entry Screen or a Data Summary Screen at block 750. If the Operator Interface is displaying a Data Entry Screen, the method moves on to block 765 where data changes are canceled and the soft keys are updated. The method then returns to block 705.

If a Data Summary Screen is being displayed, the method determines at block 755 whether the Operator Interface is at the top-most level of the hierarchy. If it is, the method does nothing at block 770 and returns to block 705. If not, the Operator Interface will move to a more general screen at block 760 and will return to block 705.

Figures 7C and D show preferred embodiments of menu structures in a hierarchy incorporating the principles of Figures 7A and B. In Figure 7C, Climate menu 7000 is shown connected to Lighting menu 7010 and to Zone menus 7001A-C. In turn, Zone Menu 7001A is connected to Data Entry menus 7002A-C with the other Zone menus having similar Data Entry Menus (7002D-I).

Referring now to Figure 9, thereshown is a sample temperature zoning system which may be used with the inventive operator interface 600. Building 900 is divided into plural rooms 901 to 904. Temperature sensors 810A through 810D are located, one to a room, through building 900 to measure the temperature of each room. The temperature sensors are connected to temperature controller 805. Temperature controller 805, which may be a Honeywell MicroCel™ controller, contains software and hardware which

monitors temperature inputs from the temperature sensors and will control temperature control means 810A through 810D so that actual space temperature is near to desired setpoints. Temperature control means may be variable air volume boxes which are well known in the art. Setpoint information may be entered into the temperature controller 805 through the operator interface 600 as described herein.

Referring now to Figures 10A through 10N thereshown are many examples of displays shown on the display means as a user moves through the user interface, and the face of the user interface unit. It should be noted that while the following description is with reference to a climate control system and associated displays, any automatic control system having a similar hierarchical structure could be displayed using the inventive user interface. In Figure 10A, a top level display is shown for the climate control system having keys 12 and 14 and a display 11. The display may show summary information about the climate control system such as inside temperature, outside temperature and the temperature in one preselected room. The display also includes a portion which identifies a key and identifies what will occur if the key is actuated (softkey). Two fixed keys, Select/OK and Back/Cancel are also shown. To view a next system, the Next System softkey would be actuated and the Lighting System display shown in Figure 10I would be displayed. Repeated actuation of the Next System softkey would lead to further displays (not shown) of systems connected to the user interface until displays associated with all of the systems have been shown. At that point, a further actuation of the softkey would produce the display of Figure 10A once again.

If the Select key is actuated in Figure 10A, the user interface would produce the display shown in Figure 10B. The display of Figure 10B shows more in depth information about the climate system. Here, the display shows relevant information for "Jon's Rm." Again, the operator is presented with plural control choices. The softkey is configured to provide information on a "Next Room" instead

of the "Next System" displayed in the display of Figure 10A. The fixed key options will be discussed in reference to Figure 10C.

Actuation of the softkey in Figure 10B causes the user interface to produce the display of Figure 10C which is for the "Master Bedroom." Note that the display for the Master Bedroom includes the same types of information as the display for Jon's Room, including the same softkey description. Repeated actuation of the Next Room softkey would cause the user interface to scroll through all rooms which are connected to the climate control system. Actuation of the Back/Cancel key would cause the user interface to return to the display of Figure 10B in this case. Actuation of the Select/OK key leads to the next level of display as shown in Figure 10D.

In Figure 10D, a new display is shown which allows the operator to display more information regarding the selected room. Here, three softkeys are configured to provide the operator with more control options. The three softkeys in this example are Climate Schedule, Time and Temp. The Temp and Time softkeys allow the operator to temporarily modify the duration of the current heat/cool cycle and temperature parameters associated with this particular room and actuation of these keys leads to the displays of Figures 10. Actuation of the Climate Schedule softkey causes the user interface to produce the display shown in Figure 10E.

In Figure 10E, the softkeys are set up so that the operator may review the schedule information for the selected room. Acutuation of the Next Time key changes the display of the time period associated with a particular day. Actuation of the Change Time/Temp softkey causes the operator interface to display the display shown in Figure 10F.

In Figure 10F, the operator is allowed to modify either the time a period begins or the setpoints for heating and cooling for the period. This selection occurs through actuation of the appropriate softkey. Figure 10G

shows the display after the Time softkey of Figure 10F has been actuated.

In Figure 10G, the display provides two softkeys for modification of the time at which a period begins. The time for the start of a period may be modified by actuation of the Ahead or Back softkeys.

Figure 10H shows the display after either the Heat softkey of Figure 10F has been actuated. By actuation of the Warmer and Cooler softkeys, the setpoint temperature can be modified as desired.

As indicated with reference to Figure 10A, actuation of the Next System softkey will cause the operator interface to display the display shown in Figure 10K. Figures 10K through 10N show movement through the displays associated with a sample Lighting System (not shown) to show how displays for another system may be arranged. Actuation of the Select/OK key causes the operator interface to display the display shown in Figure 10L, while actuation of the Next System Softkey might lead to display of information about yet another system (not shown) or lead back to the Figure 10A display if no other systems are connected to the operator interface. In Figure 10L, more specific information about the lighting system is displayed. Actuation of the Select/OK key at this point causes the operator interface to display the display shown in Figure 10M. In Figure 10M, the operator is presented with the necessary softkeys to modify lighting system control parameters. Actuation of the Light softkey causes the operator interface to move to the display shown in Figure 10N.

It should be noted that the foregoing description of movement through the displays of the inventive operator interface all match the description of the operation of the operator interface found in Figures 7A and B.

It should also be noted that as an additional aid to the operator, icons indicating location within the operator interface's hierarchy and selected system are displayed. Such icons are not an essential element of the basic

invention but are an enhancements for the benefit of the operator. The icons can be shapes which uniquely identify the system being displayed, such as a light bulb for the lighting system (see Figures 10J through 10L) or a thermostat for the Climate system (see Figures 10A through 10I).

The arrows shown in Figures 10A through 10M indicate the direction in which the menu structure may be penetrated. As an example, only the down arrow is shown in Figures 10A and 10J indicating that the operator interface is at the top level of the hierarchy. Figure 10 I depicts only an up arrow indicating that the operator interface is at the bottom level of the hierarchy in that Figure. The arrow displays may be created by setting a flag in the graphics associated with the top and bottom levels of the hierarchy to display the appropriate arrows, and a software instruction causing both arrows to be displayed when neither flag is present. Such a technique is well known in the art.

The foregoing has been a description of a novel and non-obvious apparatus and method for displaying and modifying parameters associated with one or more systems. The inventor does not intend that the foregoing description be limiting but instead defines his invention through the claims appended hereto.

I claim:

CLAIMS

1. A method for displaying information and modifying parameters associated with a system in an operator interface unit which includes a display means and data entry means, the data entry means including both fixed keys and softkeys, the operator interface having a hierarchy of displays for displaying on the display means, the hierarchy including levels of displays, each level having one or more displays, comprising the steps of:

displaying system parameter information associated with a display in a current level;

displaying a softkey command on the display means;

determining whether the softkey or the fixed key has been actuated;

displaying within a next level, a display if said fixed key has been actuated; and

displaying within a current level, a next display if said softkey has been actuated.

2. The method of claim 1, comprising the further steps of:

determining whether a top or bottom level has been reached in the hierarchy upon actuation of said fixed key and if the bottom level has been reached, doing nothing upon further actuation of the fixed key, and if not, operating normally.

3. The method of claim 2, comprising the further step of:

displaying a system parameter modification instruction in association with a softkey when said current penetration level value has a predetermined relationship to said row penetration limit value.

4. The method of claim 3, comprising the further steps of:

determining whether the softkey associated with said system parameter modification instruction has been actuated;

modifying the system parameter if the softkey associated with said system parameter modification instruction has been actuated.

5. The method of claim 3, comprising the further steps of:

determining whether the fixed key has been actuated;

entering the displayed system parameter into the system if the fixed key has been actuated.

6. The method of claim 2, wherein the operator interface has first and second fixed keys, the first fixed key serving the first function of incrementing the level of a display to be displayed and the second function of entering system parameters, the second fixed key serving the first function of decrementing the level of a display to be displayed and the second function of canceling changes to system parameters, comprising the further steps of:

determining whether the first or second fixed key has been actuated;

performing the first function for the fixed key actuated if said bottom level has not been reached; and

performing the second function for the fixed key actuated otherwise.

7. The method of claim 1, comprising the further step of:

displaying an icon on the display means which identifies the system for which information is being displayed.

8. The method of claim 2, comprising the further steps of:

displaying a symbol indicating that modification of the display means to show displays in a next level is possible whenever a current display is not from said bottom level; and

displaying a symbol indicating that modification of the display means to display screens in a previous level is possible if the current display is not from the top level.

9. An apparatus for displaying information and modifying parameters associated with a system, comprising:

a communications bus (635);

a controller (600) connected to the communications bus for controlling operations of the apparatus;

a display means (10, 11) connected to said communications bus for displaying displays which contain information associated with the system;

memory connected to said communications bus, said memory storing instructions for said controller and format and data information for a menu of displays for displaying on the display means, the menu including plural levels of displays, said displays providing information about the system;

data entry means (12, 13, 14) connected to the bus, said data entry means including a fixed key (13, 14) and a softkey (12), actuation of said fixed key causing said display means to show a display from a next level, actuation of said fixed key causing said display means to show a next display from a current level; and

a communications interface (635) for connection of said communications bus to the system.

10. The apparatus of claim 9, wherein said memory stores a bottom level (7012A-I) and a top level (7010) and said apparatus further comprises a tracking means for tracking a current penetration level within the menu and comparison means for comparing said level penetration limit to said top and bottom levels as required.

11. The method of claim 10, wherein:

said display means displays a system parameter modification instruction in association with a softkey when said current penetration level value has a predetermined relationship to said row penetration limit value.

12. The apparatus of claim 11, wherein:

said controller modifies the system parameter being displayed if the softkey associated with said system parameter modification instruction has been actuated.

13. The method of claim 11, wherein:

said controller enters the displayed system parameter into the system if the fixed key has been actuated.

14. The apparatus of claim 10, wherein:

the data entry means has first and second fixed keys, the first fixed key serving the first function of incrementing the level of a display to be displayed and the second function of entering system parameters, the second fixed key serving the first function of decrementing the level of a display to be displayed and the second function of canceling changes to system parameters.

15. The apparatus of claim 14, wherein:

said controller causes said first and second fixed keys to perform their respective first functions for the fixed key actuated if said level penetration limit does not have said predetermined relationship to said bottom level; and

said controller causes said first and second fixed keys to perform their respective second functions for the fixed key actuated, otherwise.

16. The apparatus of claim 9, wherein:

said memory stores an icon for display on said display means, said icon being symbolic of the system.

17. The method of claim 10, wherein:

said controller instructs said display means to display a symbol indicating that modification of the display means to display screens in a next level from a present display is possible if said current level is not the bottom level; and

said controller instructs said display means to display a symbol indicating that modification of the display means to show displays in a previous level from a present display is possible if said current row penetration level is not the top level.

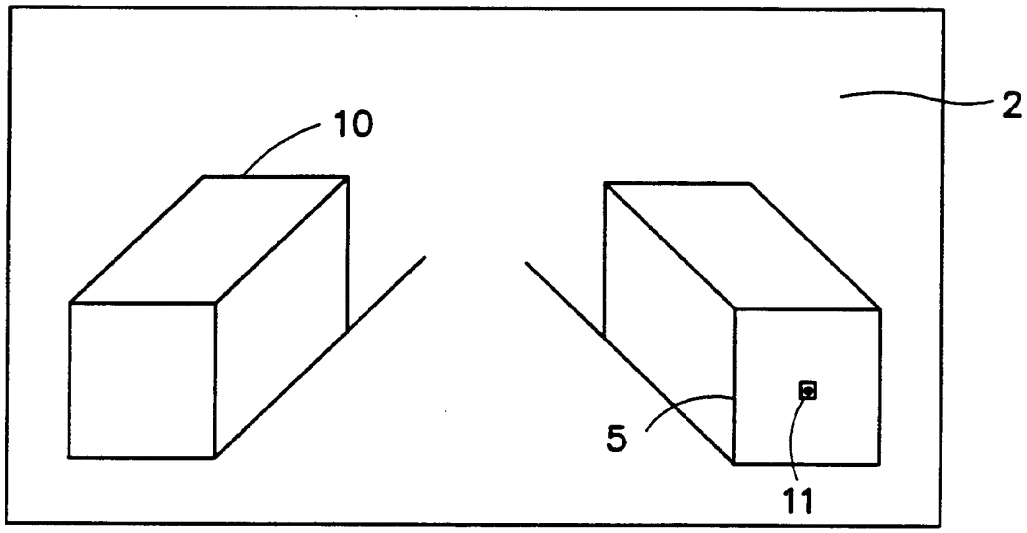

Fig. 1
(Prior Art)

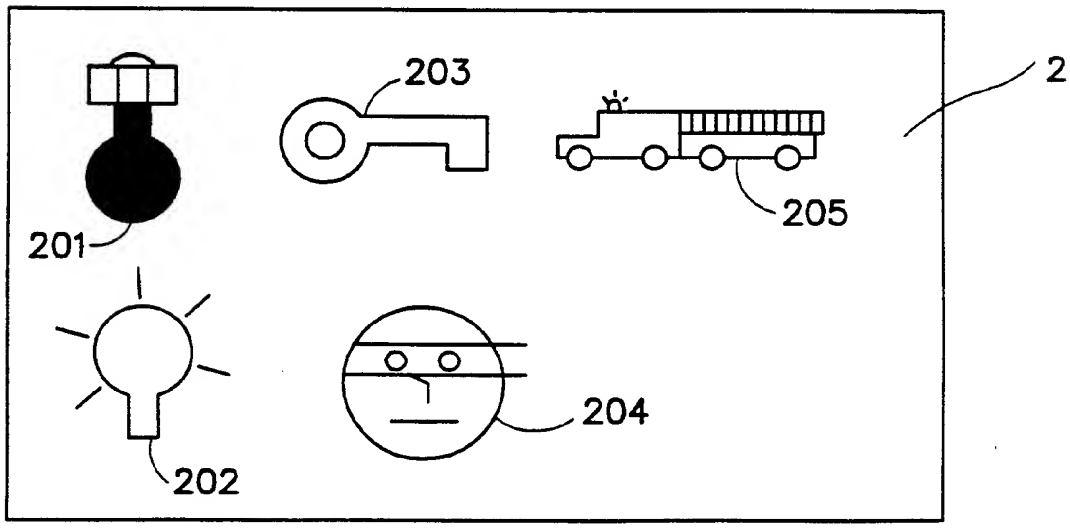

Fig. 2
(Prior Art)

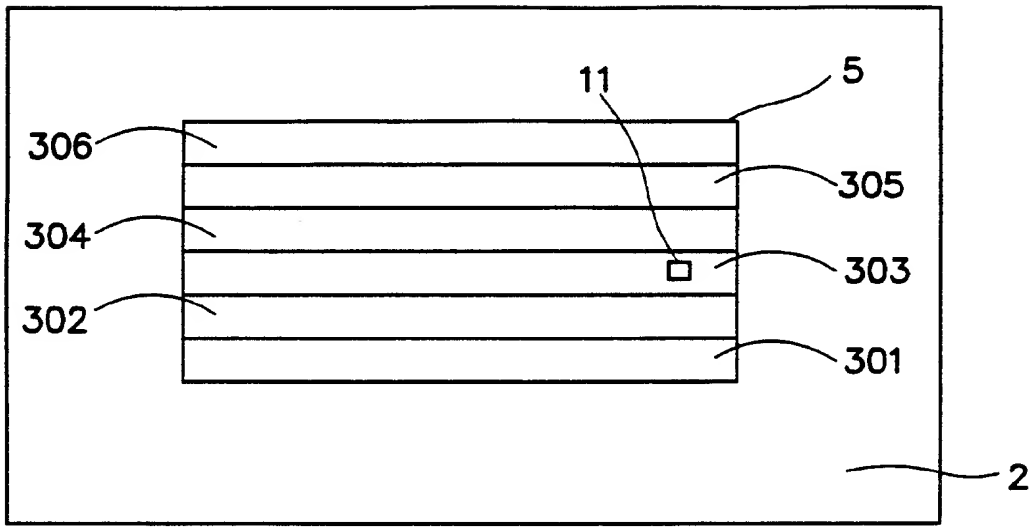

Fig. 3
(Prior Art)

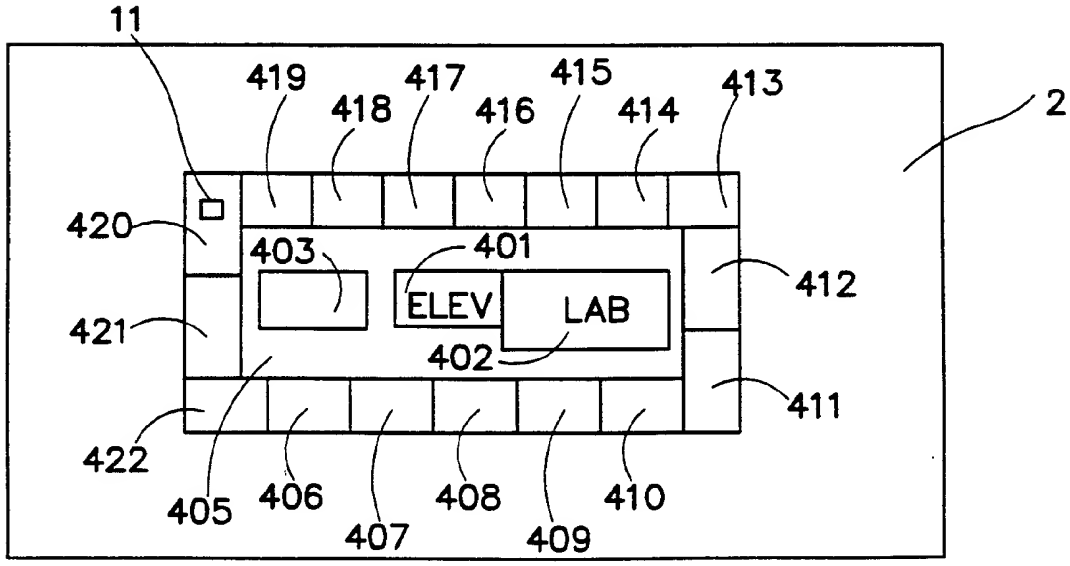

Fig. 4
(Prior Art)

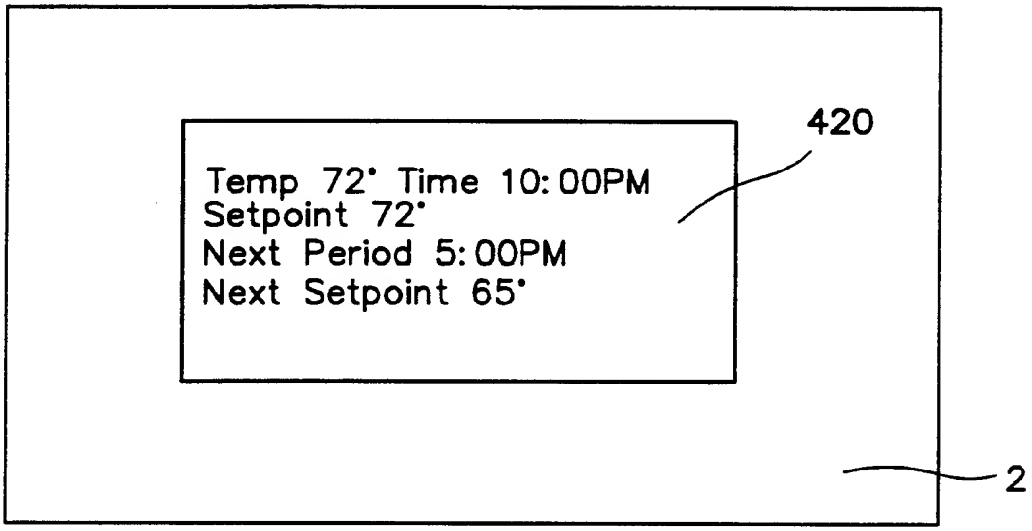

Fig.5

(Prior Art)

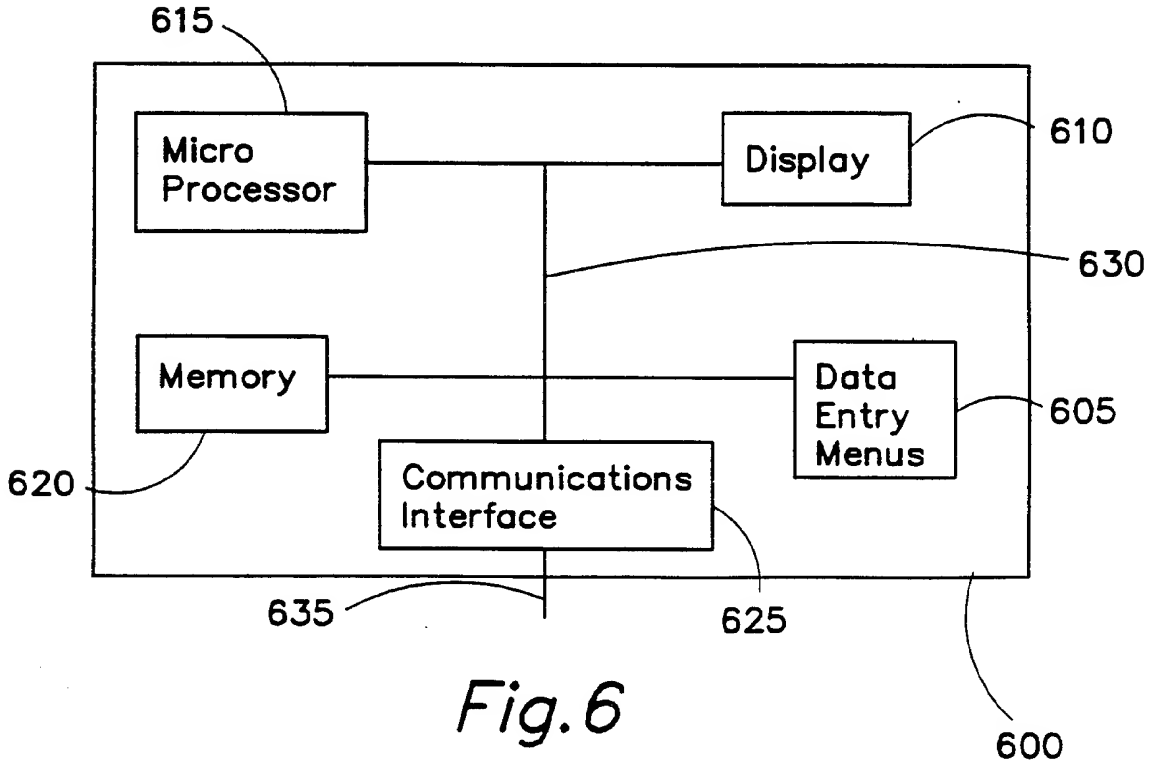

Fig.6

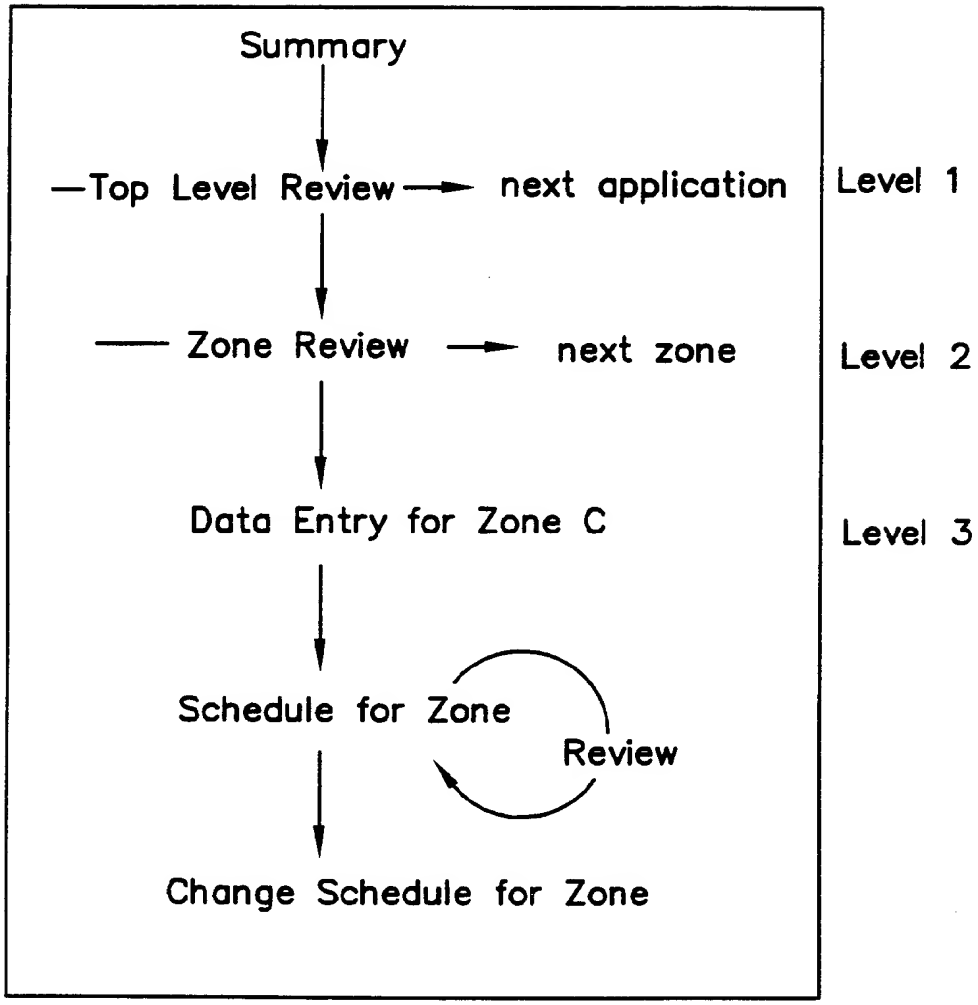
Summary
—Top Level Review → next application
Level 1
— Zone Review → next zone
Level 2
Data Entry for Zone C
Level 3
Schedule for Zone
Review
Change Schedule for Zone

Fig. 7A

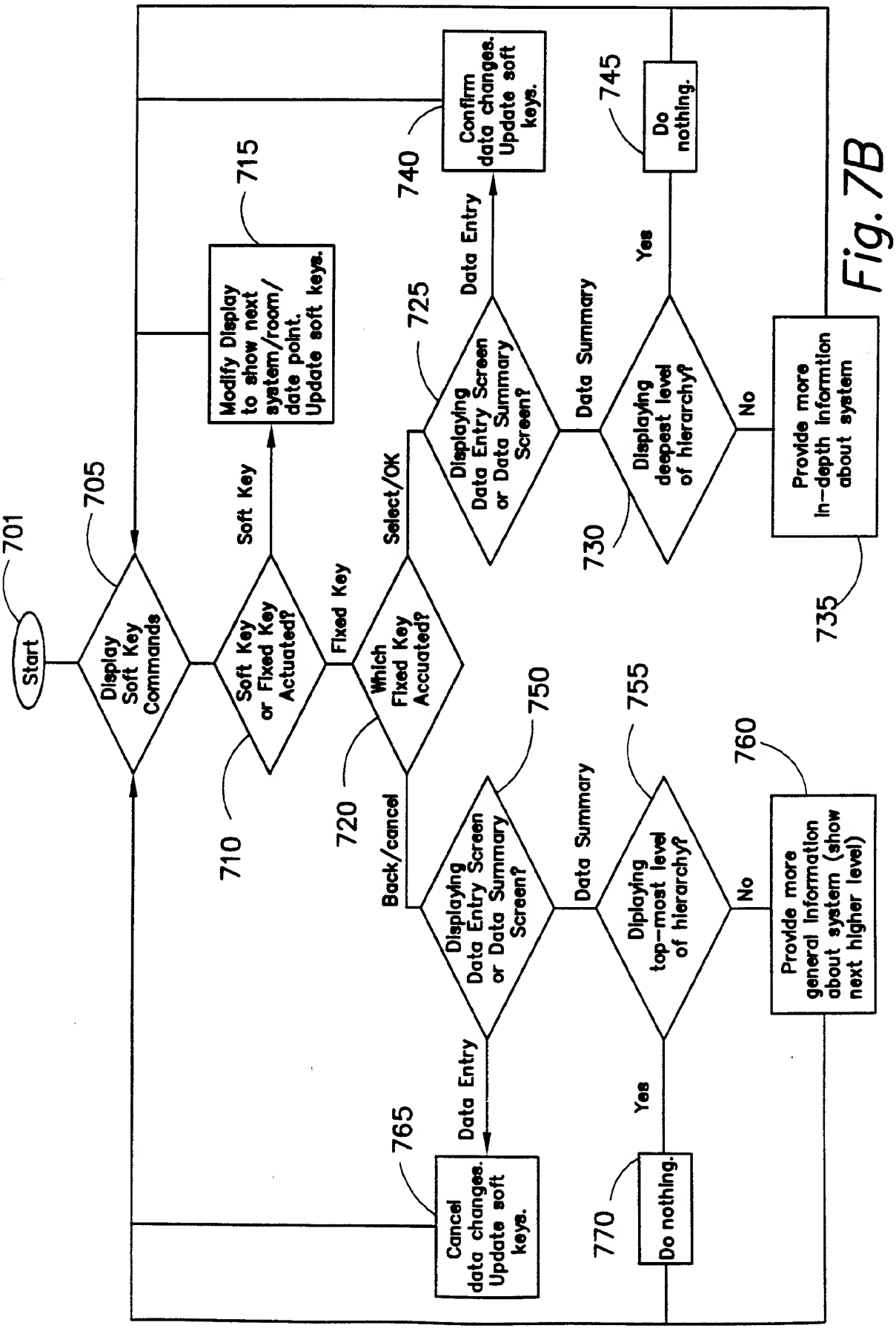
Start
701
Display Soft Key Commands
705
Soft Key or Fixed Key Actuated?
710
Soft Key
Modify Display to show next system/room/ date point. Update soft keys.
715
Fixed Key
Which Fixed Key Accuated?
720
Select/OK
Displaying Data Entry Screen or Data Summary Screen?
725
Data Entry
Confirm data changes. Update soft keys.
740
Data Summary
Displaying deepest level of hierarchy?
730
Yes
Do nothing.
745
No
Provide more in-depth information about system
735
Back/cancel
Displaying Data Entry Screen or Data Summary Screen?
750
Data Entry
Cancel data changes. Update soft keys.
765
Data Summary
Displaying top-most level of hierarchy?
755
Yes
Do nothing.
770
No
Provide more general information about system (show next higher level)
760

Fig. 7B

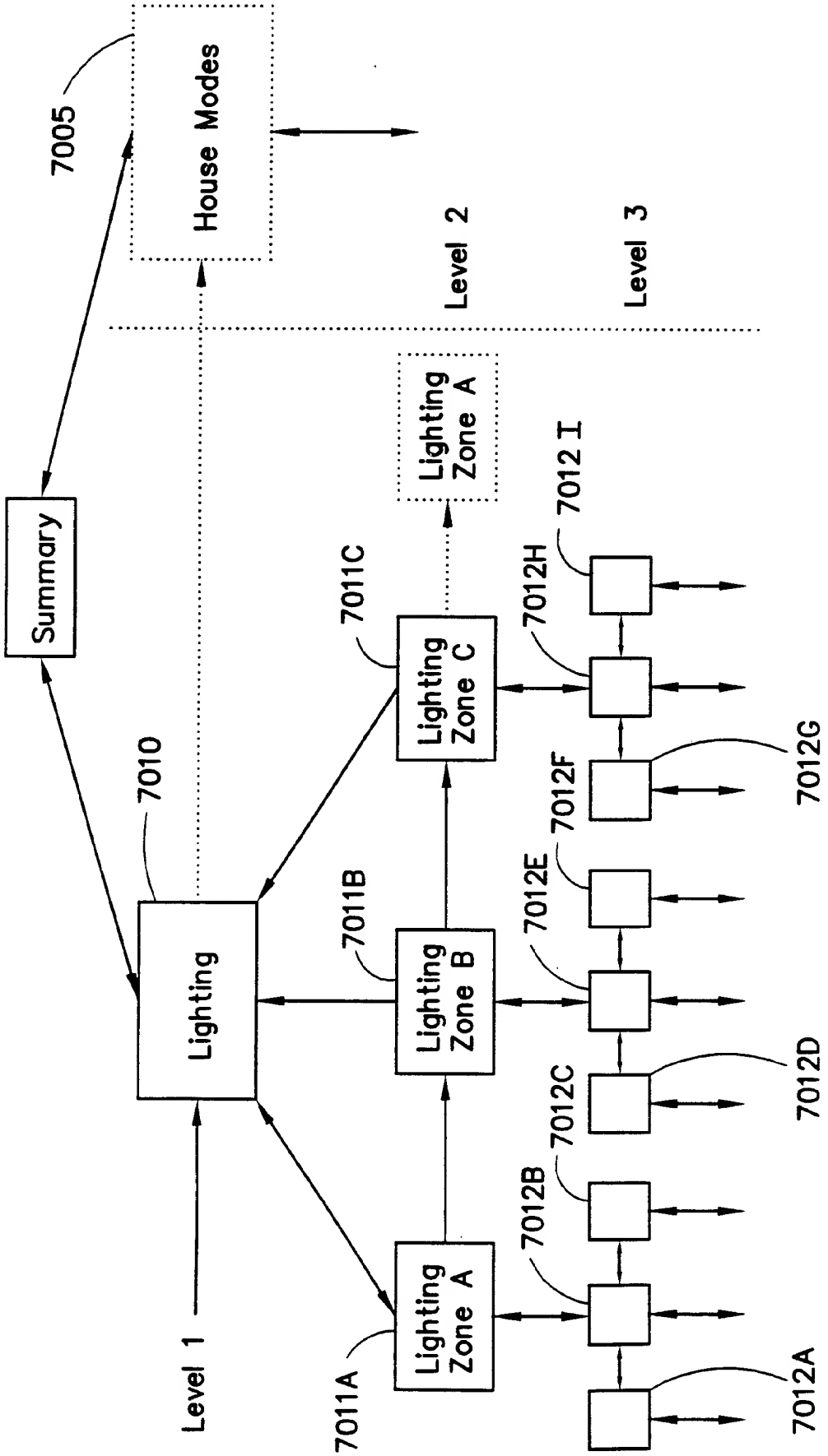
7005
House Modes
Level 2
Level 3
Summary
Lighting Zone A
7012 I
7011C
7012H
Lighting Zone C
7010
7012G
7012F
7011B
7012E
Lighting
Lighting Zone B
7012D
7012C
7012B
Level 1
7011A
Lighting Zone A
7012A

Fig. 7C

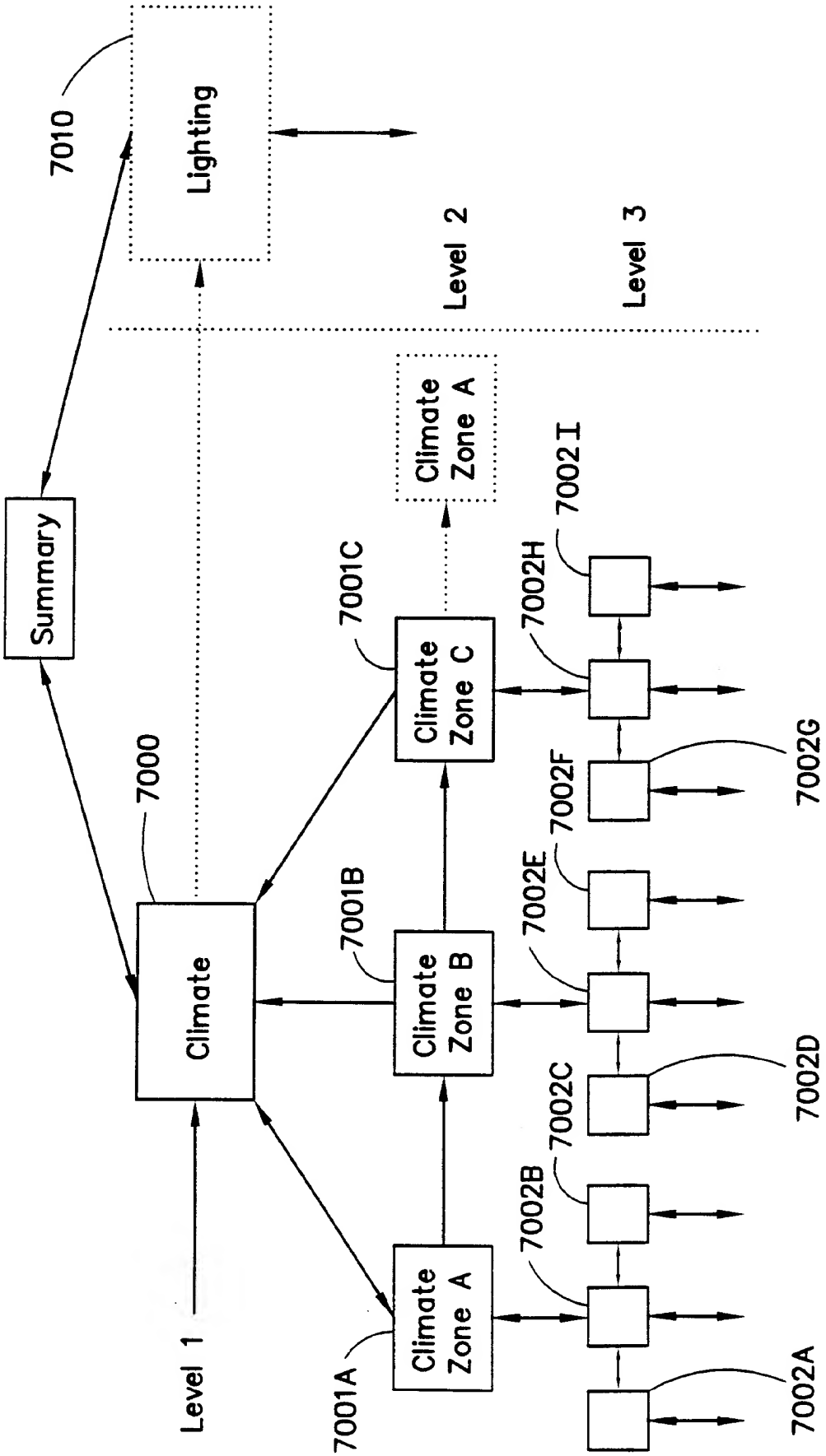
7010
Lighting
Level 2
Level 3
Summary
Climate Zone A
7002 I
7001C
7002H
Climate Zone C
7000
7002G
7002F
7001B
7002E
Climate Zone B
Climate
7002D
7002C
7002B
Climate Zone A
Level 1
7001A
7002A

Fig. 7D

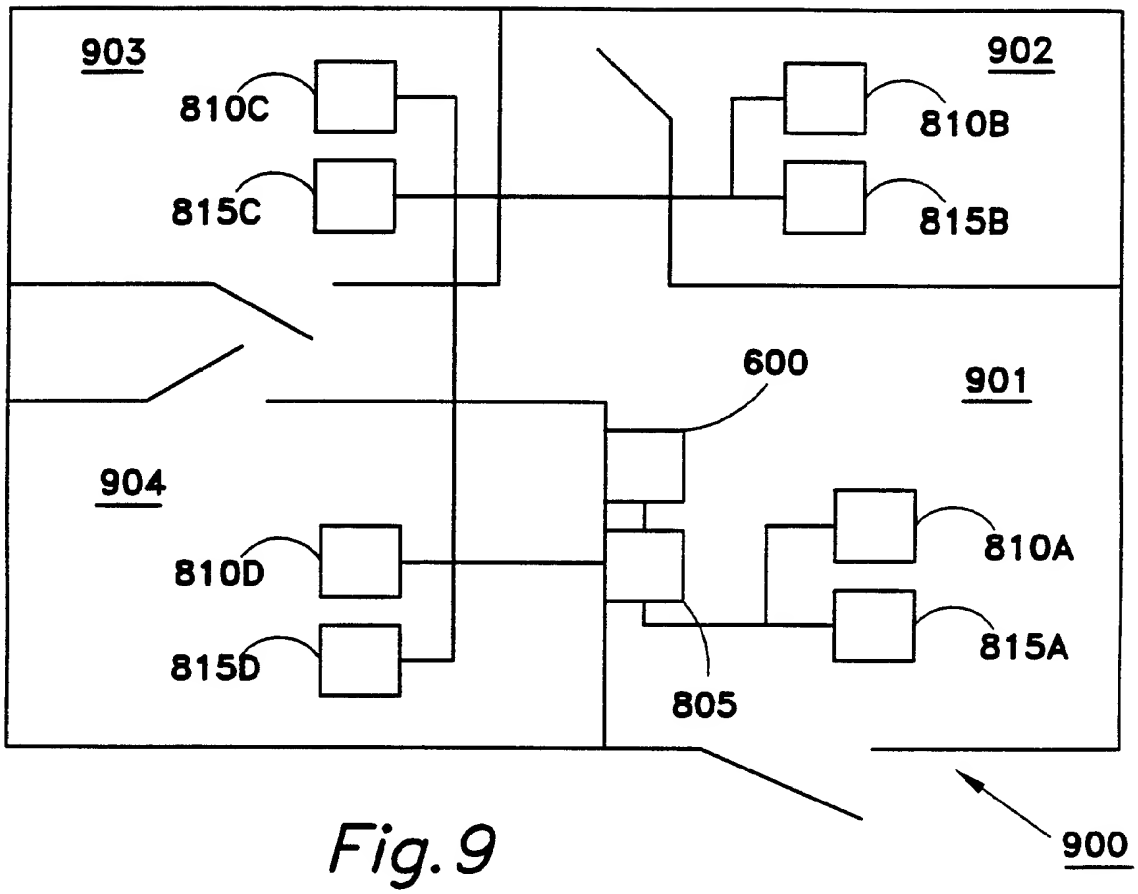
903
902
810C
810B
815C
815B
600
901
904
810A
810D
815A
815D
805
900

Fig. 9

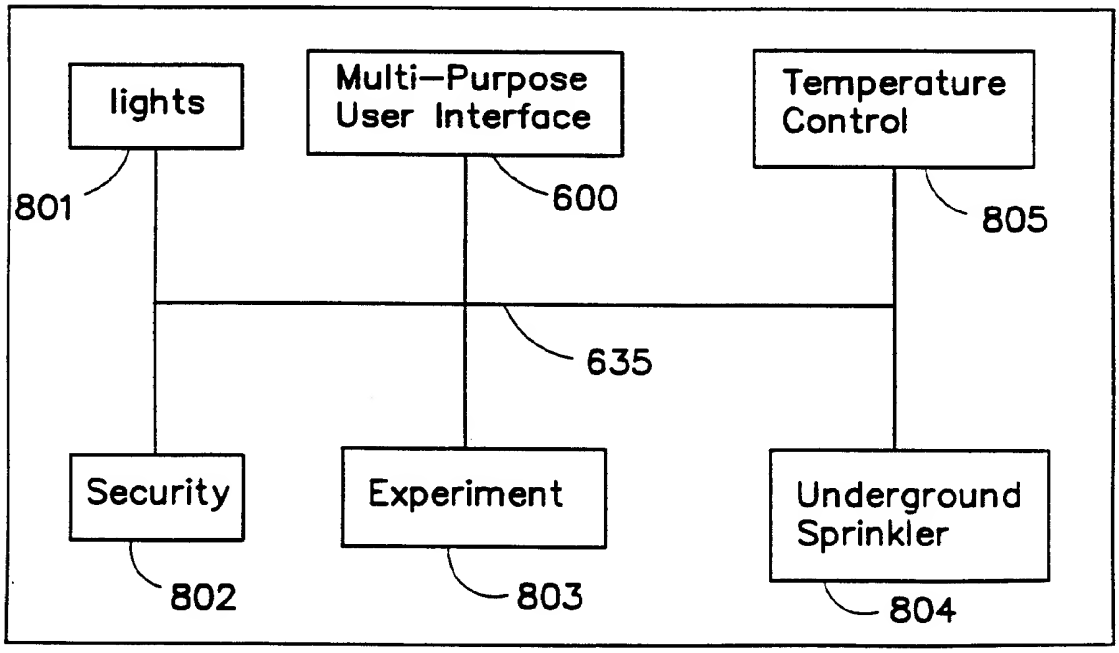
lights
Multi–Purpose User Interface
Temperature Control
801
600
805
635
Security
Experiment
Underground Sprinkler
802
803
804

Fig. 8

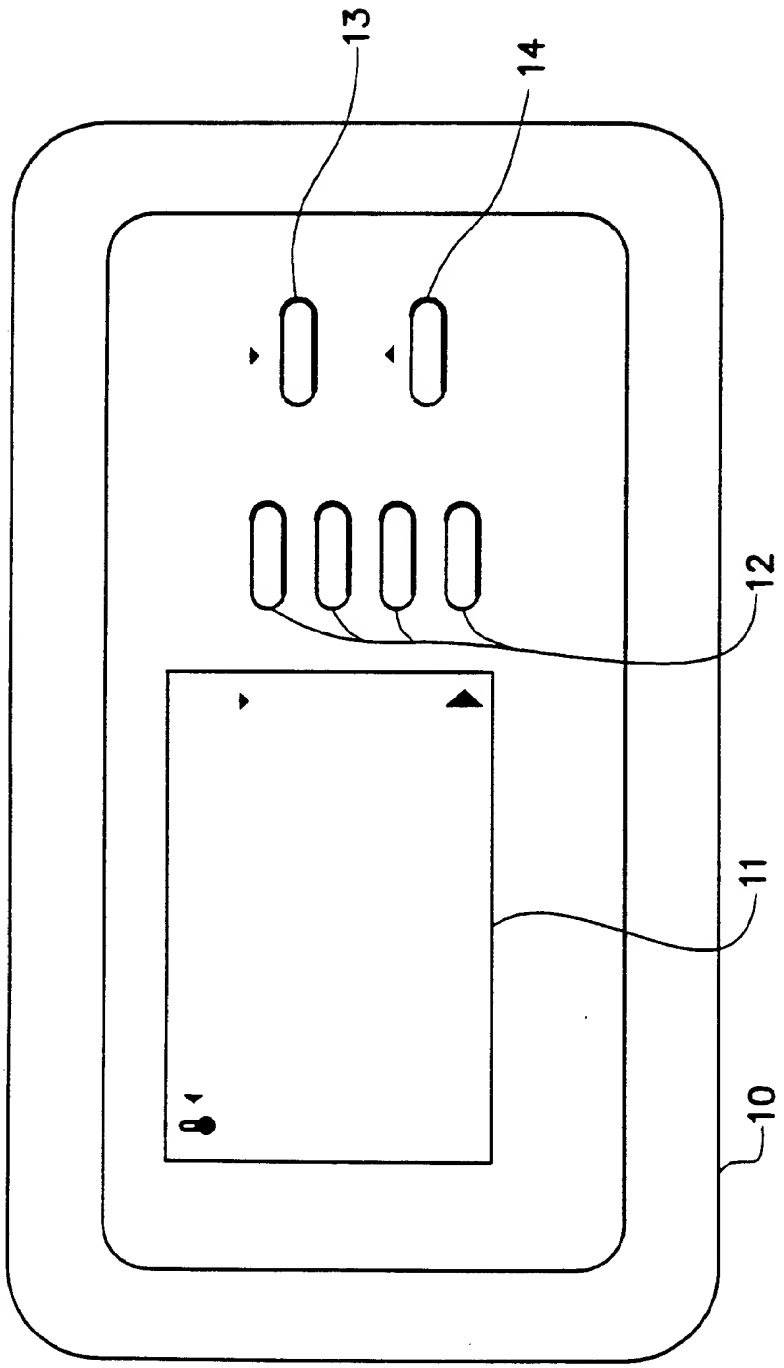

Fig. 10A

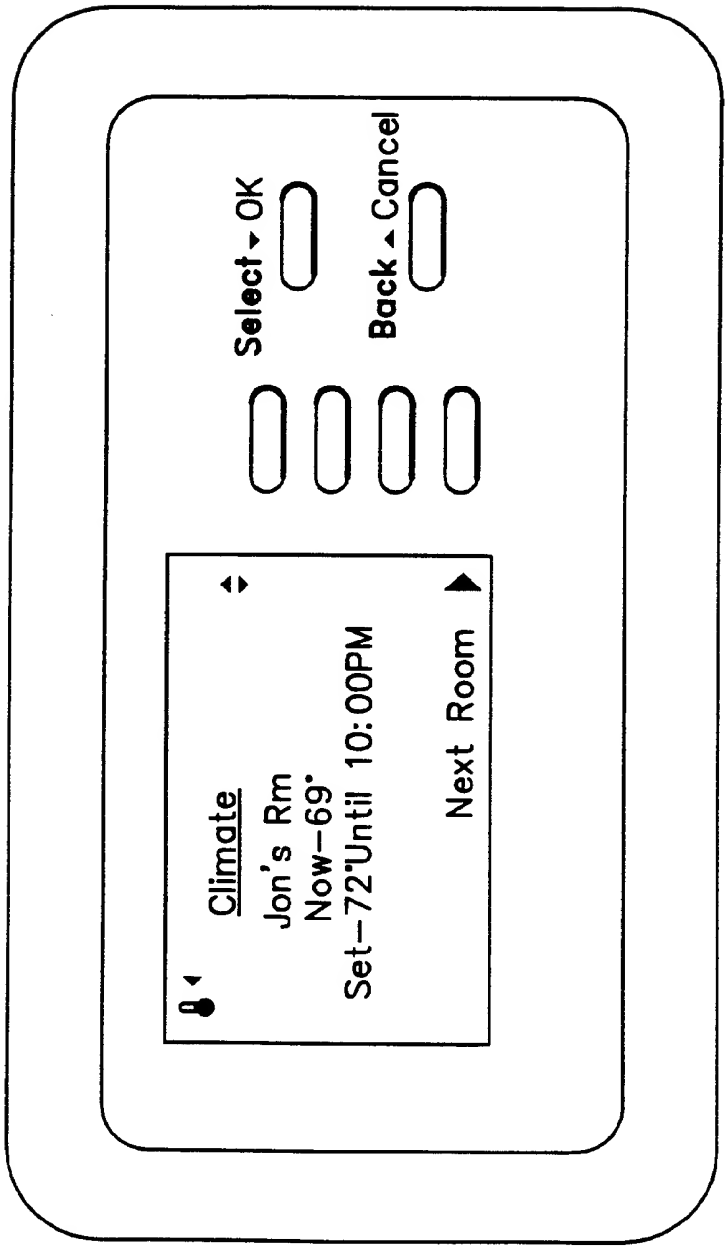
Select OK
Back Cancel
Climate
Jon's Rm
Now—69°
Set—72°Until 10:00PM
Next Room

Fig. 10B

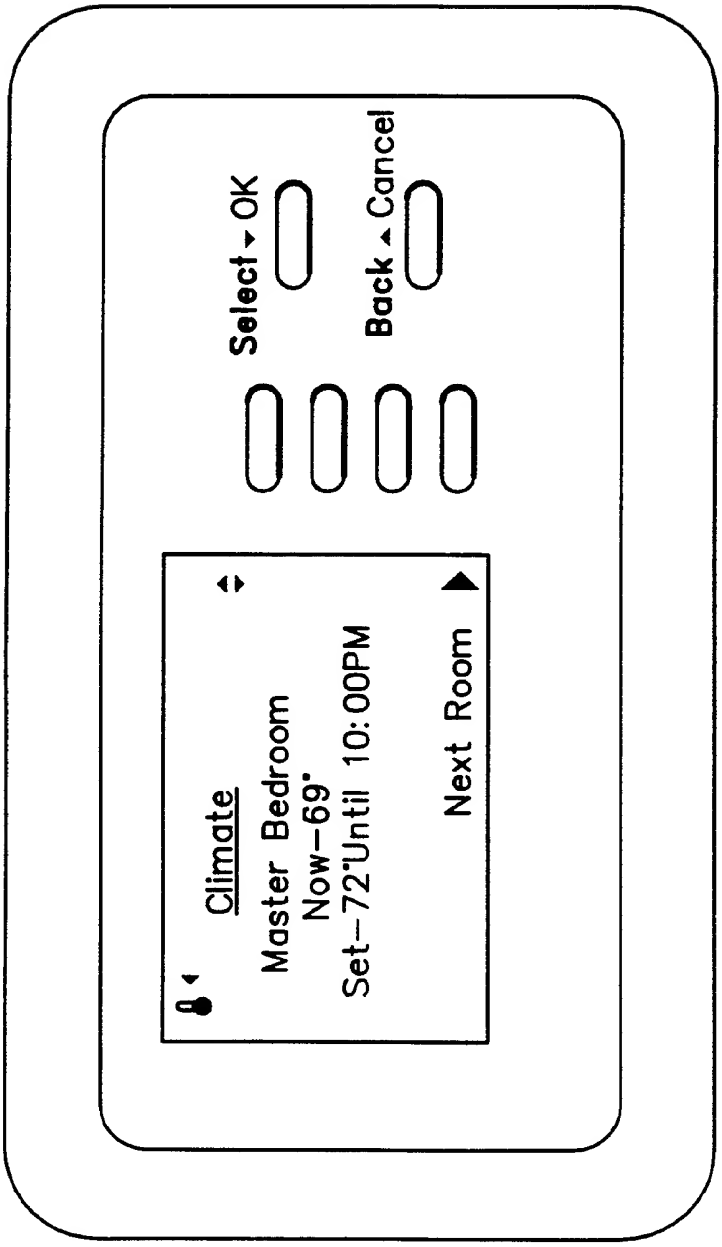
Select OK
Back Cancel
Climate
Master Bedroom
Now–69°
Set–72°Until 10:00PM
Next Room

Fig. 10C

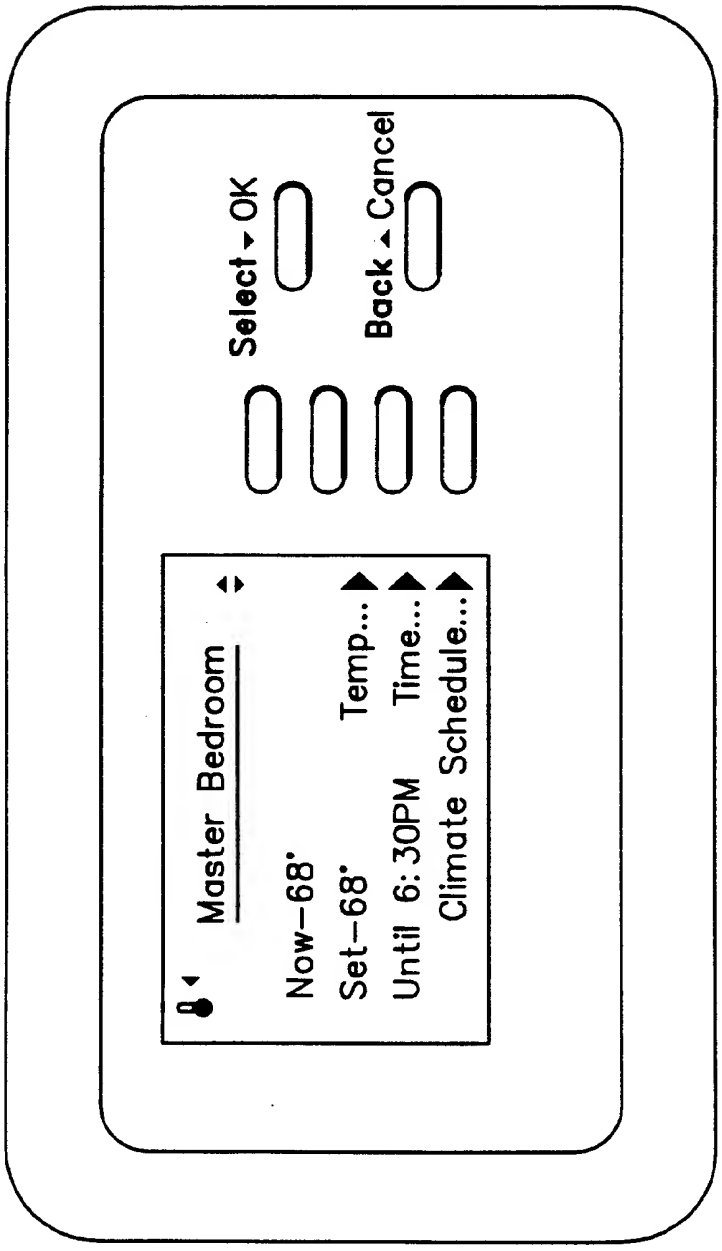
Select OK
Back Cancel
Master Bedroom
Now–68°
Set–68° Temp...
Until 6:30PM Time...
Climate Schedule...

Fig. 10D

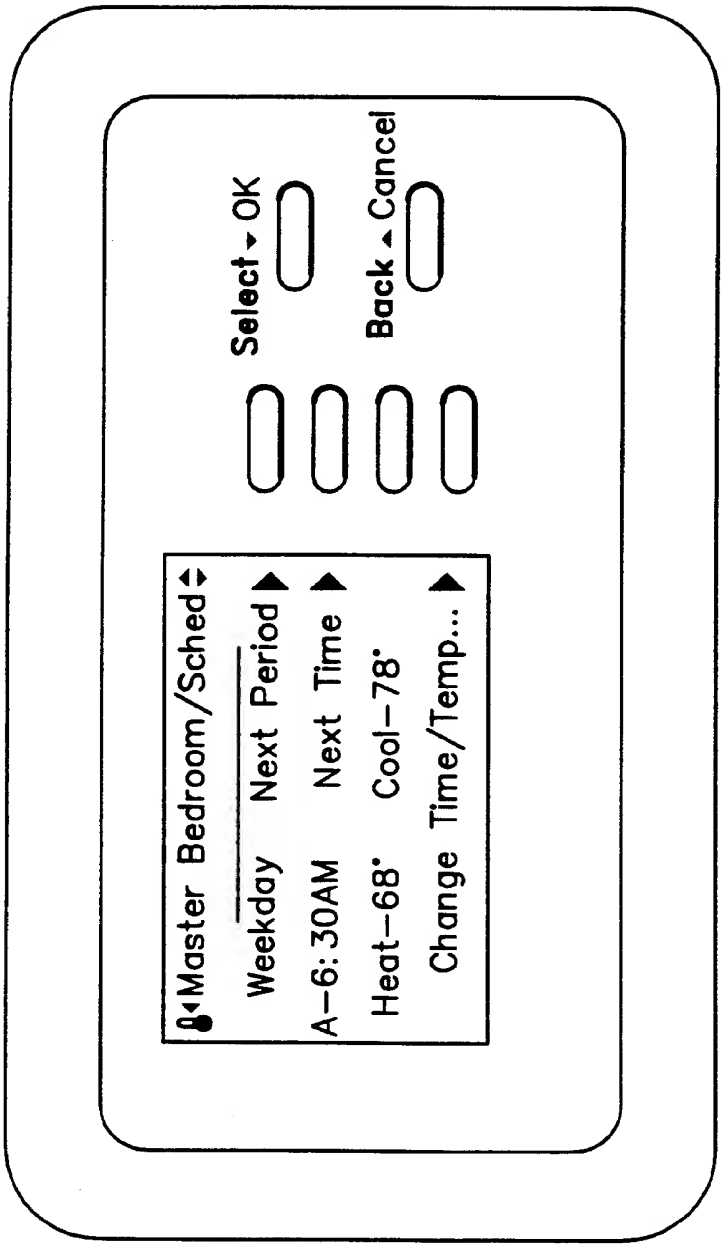
Master Bedroom/Sched
Weekday Next Period
A–6:30AM Next Time
Heat–68° Cool–78°
Change Time/Temp...
Select OK
Back Cancel

Fig. 10E

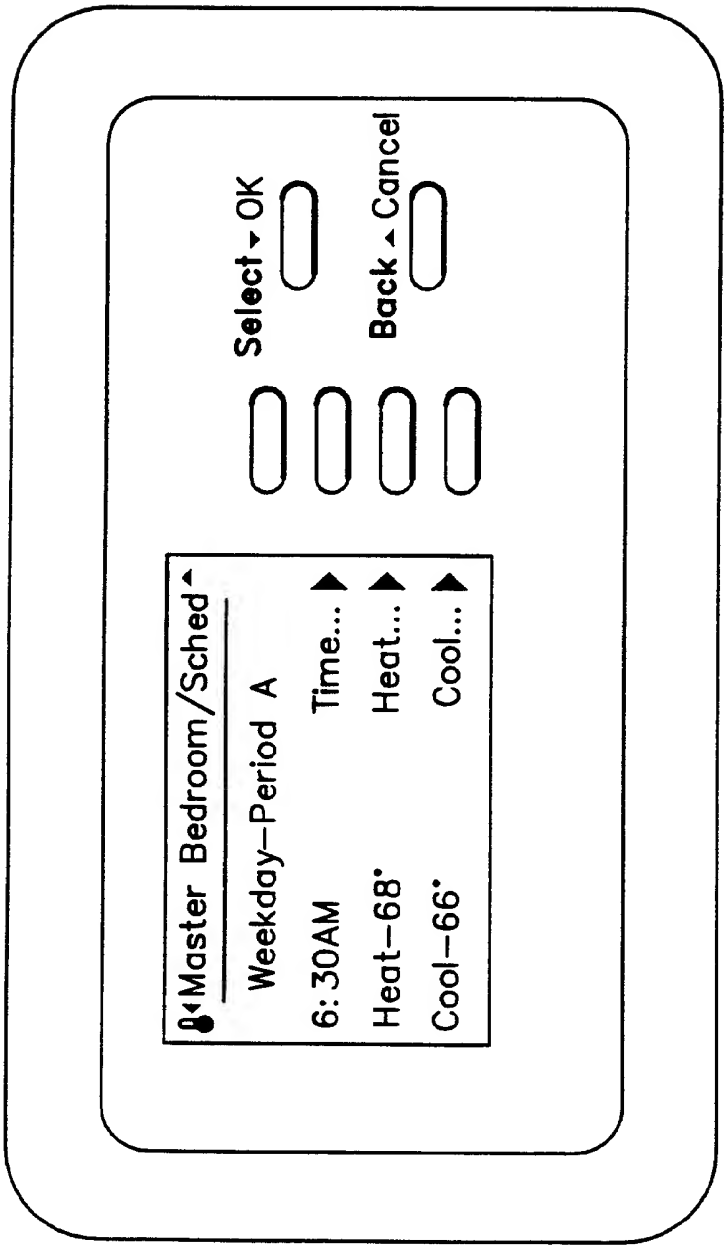
Master Bedroom/Sched
Weekday–Period A
6:30AM Time...
Heat–68° Heat...
Cool–66° Cool...
Select OK
Back Cancel

Fig. 10F

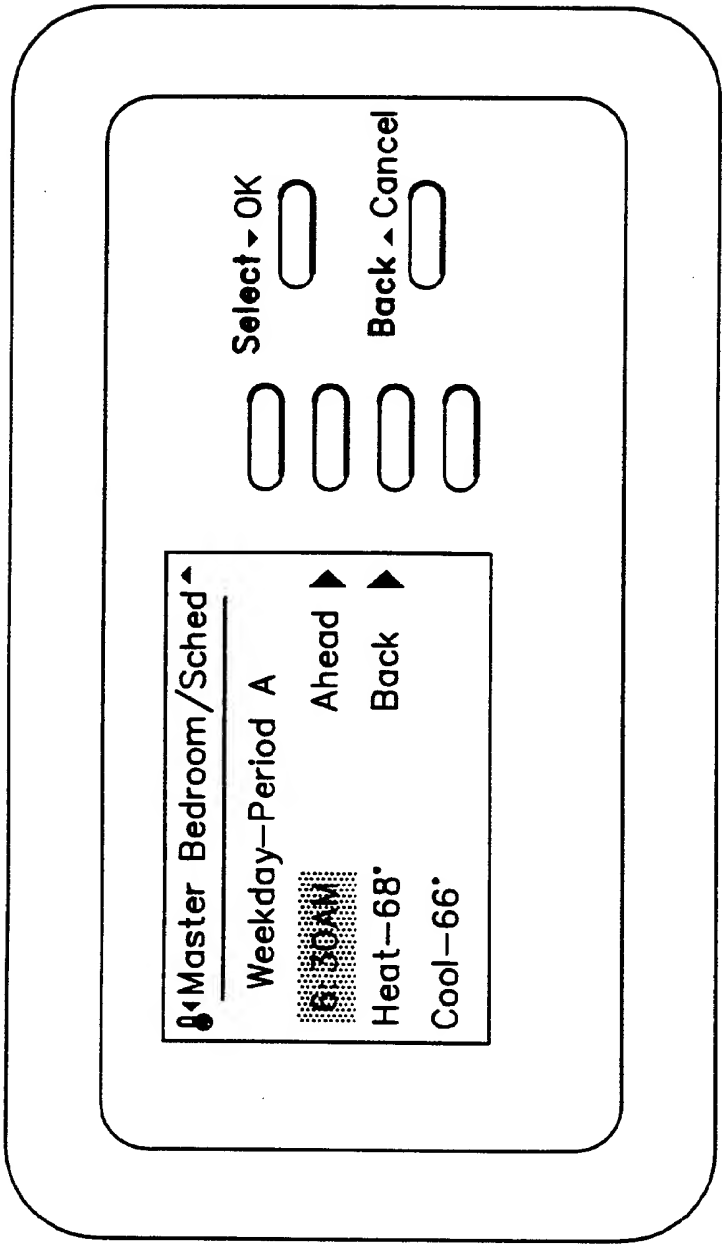
Master Bedroom/Sched
Weekday–Period A
6:30AM
Heat–68°
Cool–66°
Ahead
Back
Select OK
Back Cancel

Fig. 10G

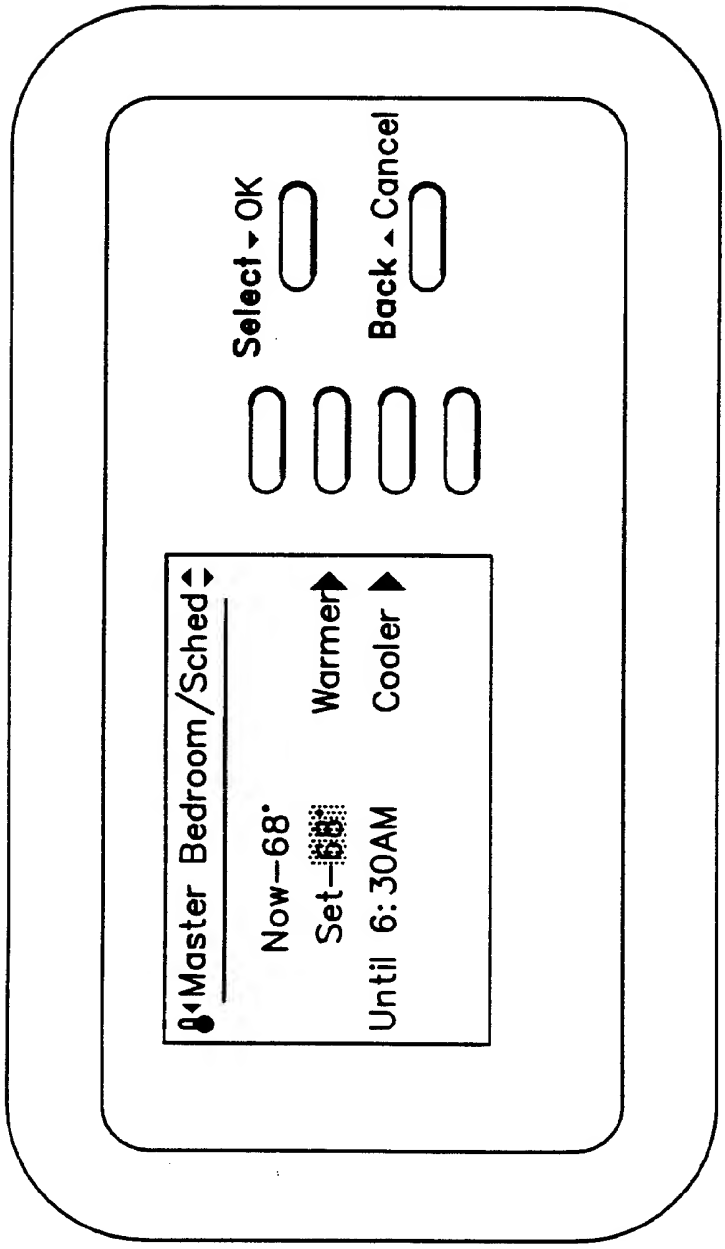
Master Bedroom/Sched
Now—68°
Set—68
Until 6:30AM
Warmer
Cooler
Select OK
Back Cancel

Fig. 10H

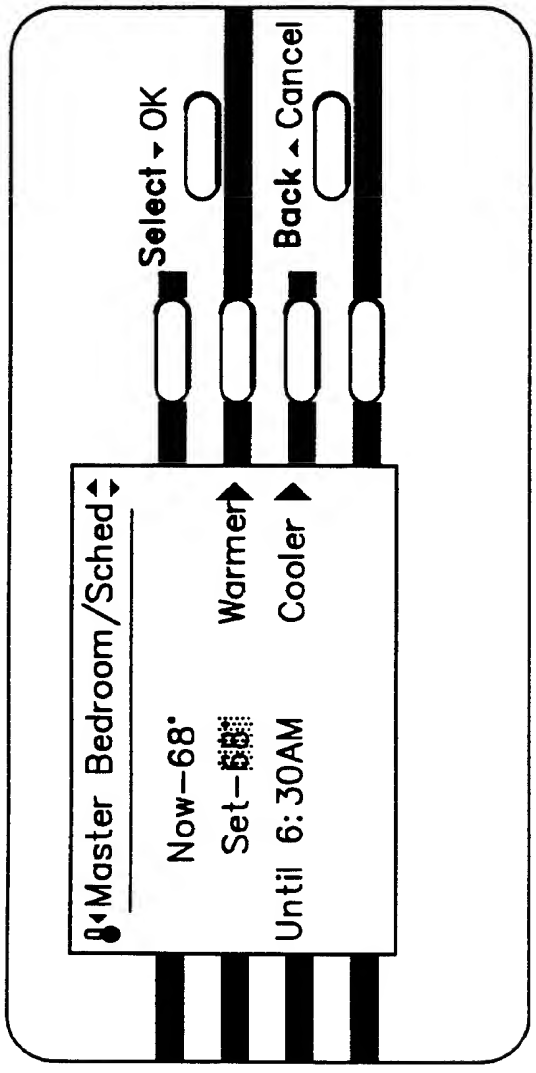
Select OK
Back Cancel
Master Bedroom/Sched
Now—68°
Set—[illegible]
Until 6:30AM
Warmer
Cooler

Fig. 10 I

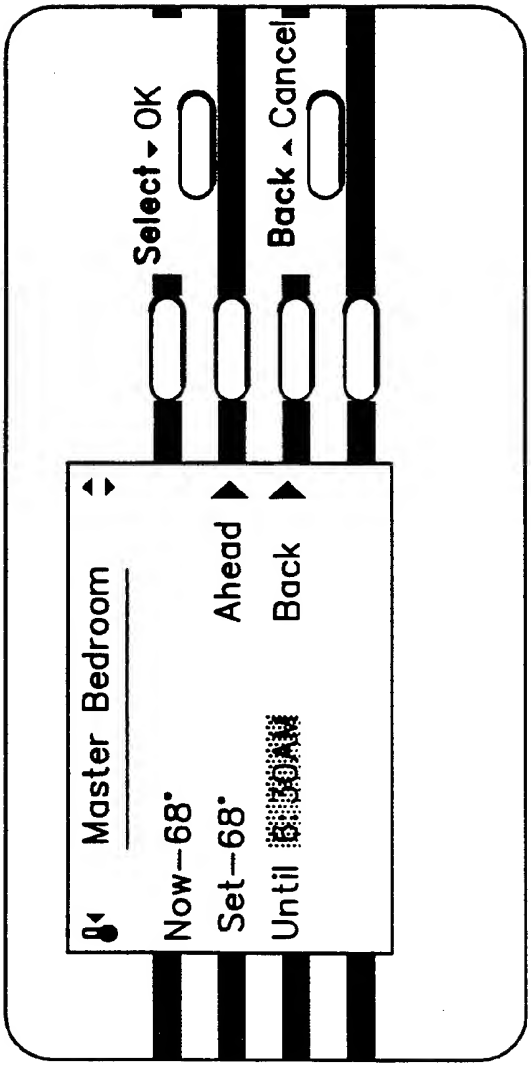
Select OK
Back Cancel
Master Bedroom
Now—68°
Set—68°
Until
Ahead
Back

Fig. 10J

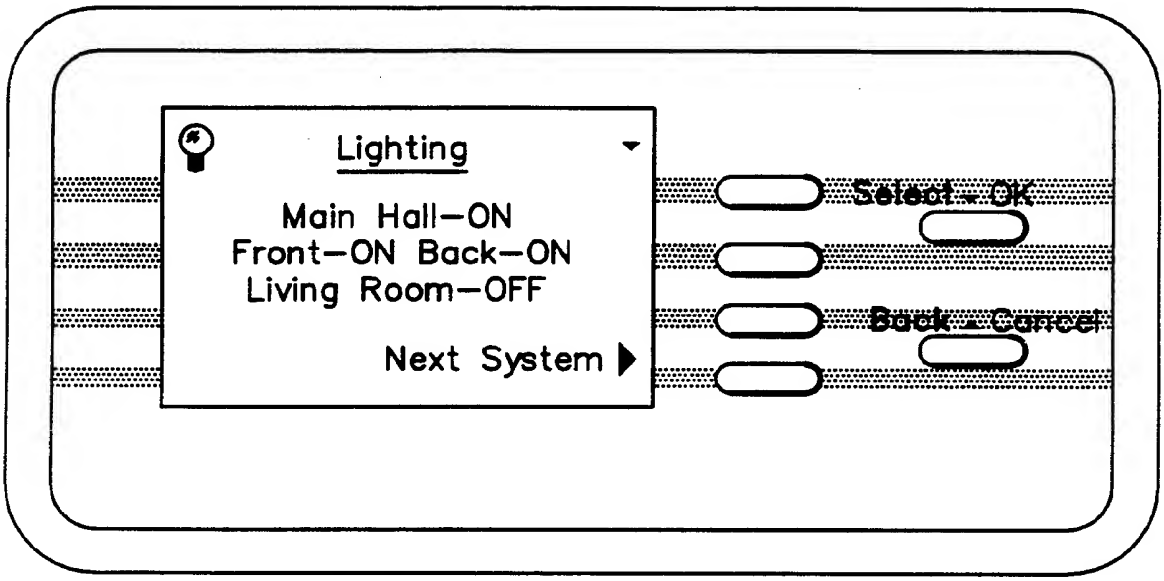

Fig. 10K

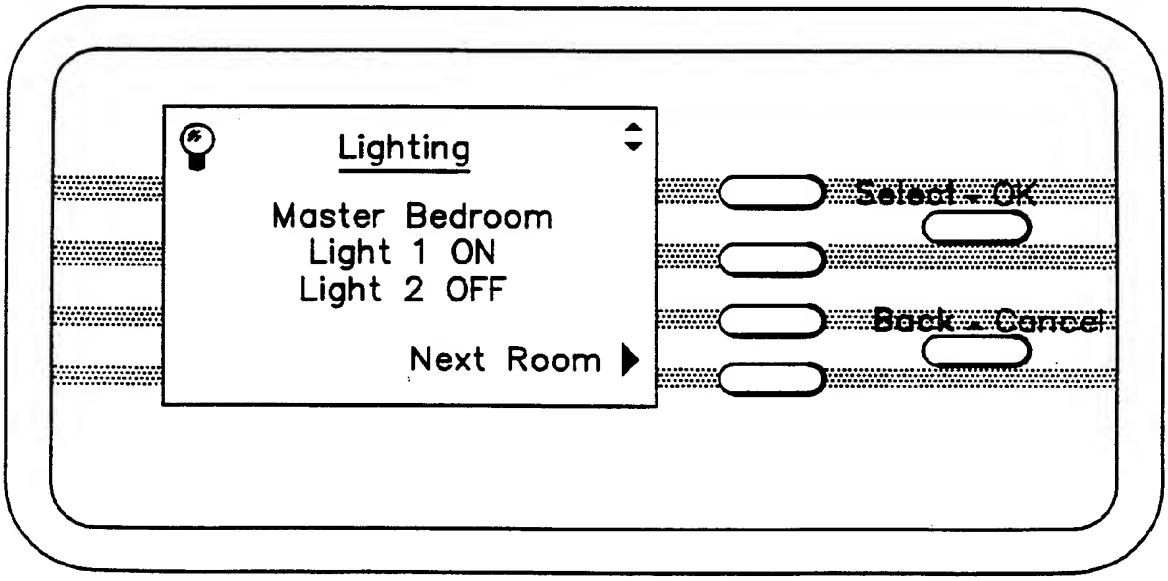

Fig. 10L

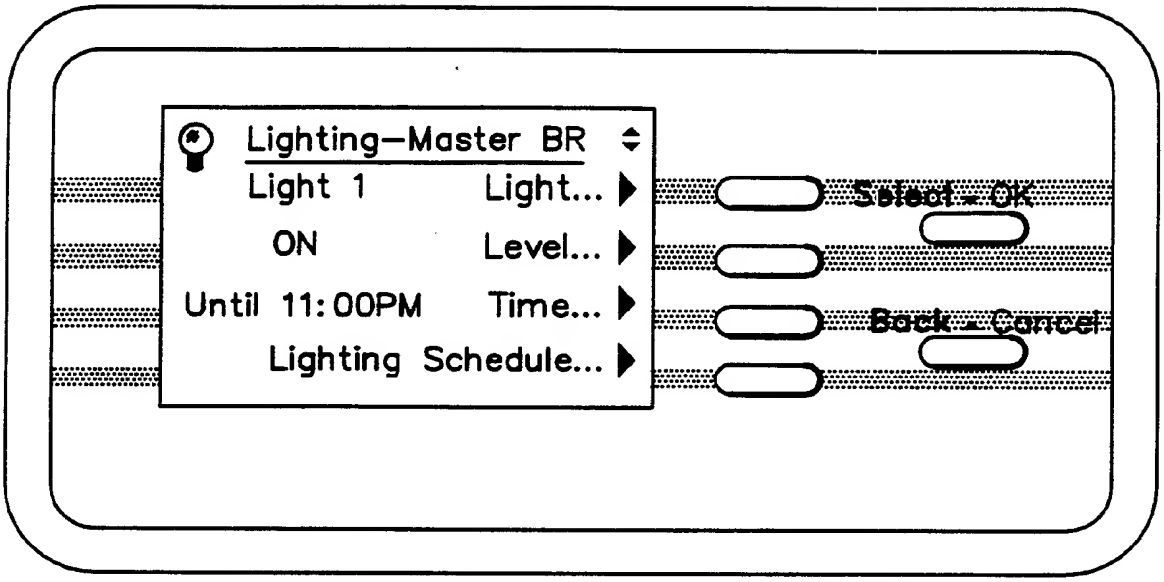

Fig. 10M

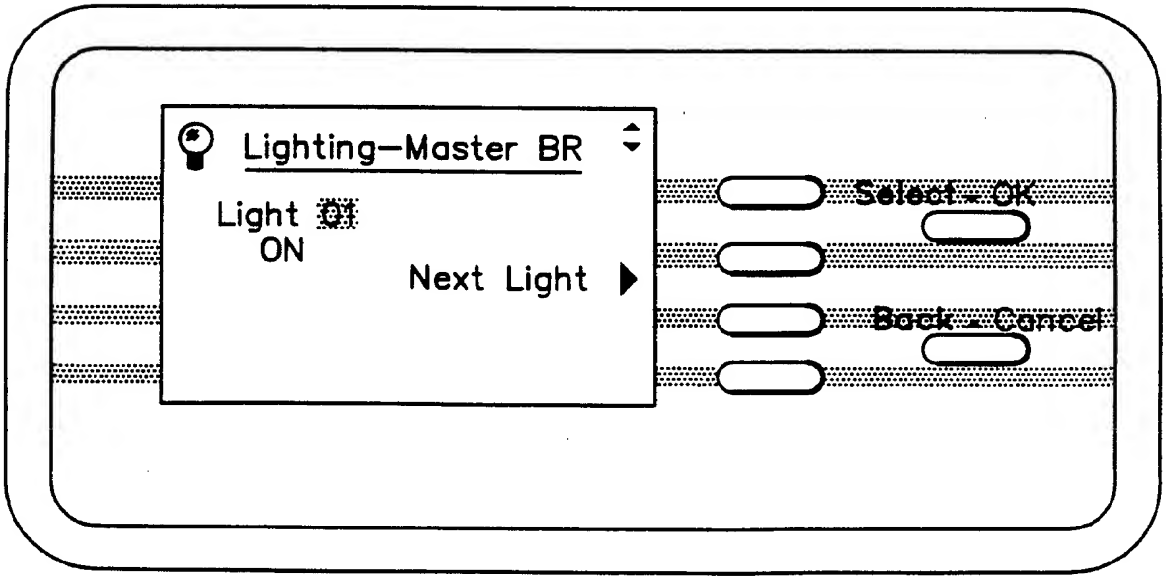

Fig. 10N

INTERNATIONAL SEARCH REPORT

Intern ıal Application No
PCT/US 94/00035

A. CLASSIFICATION OF SUBJECT MATTER

G 06 F 15/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G 06 F 15/00,G 09 G 5/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, A1, 0 246 472 (SIEMENS) 25 November 1987 (25.11.87), - abstract. --	1
X	EP, A2, 0 354 487 (W.E.G.-LEGRAND) 11 August 1988 (11.08.88), abstract. --	1
X	DE, A1, 3 208 136 (ROHDE & SCHWARZ) 15 September 1983 (15.09.83), abstract. --	1
A	US, A, 4 944 613 (FUKUSHINGE) 31 July 1990 (31.07.90), abstract. ----	1

☐ Further documents are listed in the continuation of box C.

☐ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 April 1994	04. 05. 94

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	KUNZE e.h.

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ANHANG

zum internationalen Recherchenbericht über die internationale Patentanmeldung Nr.

ANNEX

to the International Search Report to the International Patent Application No.

ANNEXE

au rapport de recherche international relatif á la demande de brevet international n°

PCT/US 94/00035 SAE 84827

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben. Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The Office is in no way liable for these particulars which are given merely for the purpose of information.

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Im Recherchenbericht angeführtes Patentdokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
EP A1 246472	25-11-87	DE C0 3771924 EP B1 246472 JP A2 62269596 US A 4843386	12-09-91 07-08-91 24-11-87 27-06-89
EP A2 354487	14-02-90	AT E 88287 DE A1 3827327 DE C0 58904056 EP A3 354487 EP B1 354487 ES T3 2040422	15-04-93 15-02-90 19-05-93 17-07-91 14-04-93 16-10-93
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US A 4944613	31-07-90	JP A2 63173122	16-07-88